Class- X
Post Mid Term Examination, 2024-25
Subject- Mathematics
Set : B2

Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion- Reason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Question of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take π =22/7 wherever required if not stated.
11. Use of calculators is not allowed.

SECTION A

Section A consists of 20 questions of 1 mark each.

1 The number of zeroes of a polynomial whose graph is either touching or intersecting the axes only at the points (–3, 0), (0, 2) and (3, 0) are **1**

(A) 1 (B) 2 (C) 3 (D) 0

2 If the zeroes of the polynomial $p(x) = 2x^2 + 13x + k$ are reciprocal of each other, then the value of k is : **1**

(A) – 2 (B) 2 (C) $\frac{13}{2}$ (D) $\frac{2}{13}$

3 The value of $'p'$ for which the pair of linear equations $(3p + 5)x + 2y - 7 = 0$ and $10x - 2y + 7 = 0$ has infinitely many solutions is: **1**

(A) -5 (B) 5 (C) $\frac{5}{3}$ (D) $\frac{3}{5}$

4 The quadratic equation $2x^2 - \sqrt{5}x - 1 = 0$ has **1**

(A) two distinct real roots (B) two equal real roots

(C) no real roots (D) more than 2 real roots

5 Cards with numbers 2 to 101 are placed in a box. A card is selected at random. The probability that the card has an odd number is **1**

(A) $\frac{1}{2}$ (B) $\frac{49}{99}$ (C) $\frac{49}{100}$ (D) $\frac{50}{99}$

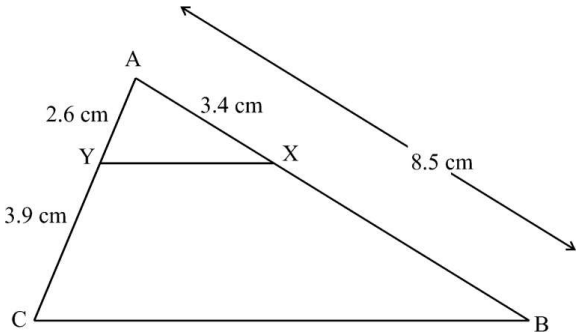
6 If $4\ sec\ \theta - 5 = 0$, then the value of $cot\ \theta$ is : **1**

(A) $\frac{3}{4}$ (B) $\frac{4}{5}$ (C) $\frac{5}{3}$ (D) $\frac{4}{3}$

7 A hollow vessel is in the shape of a cylinder standing on a hemisphere with both their radii being equal to 1 cm and the height of the cylinder is equal to its radius. The inner surface area of the vessel (in sq cm) is **1**

(A) 2π (B) π (C) 4π (D) 3π

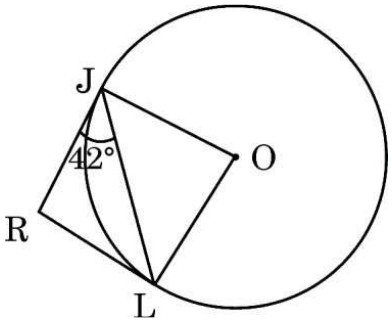
8 In the figure, X and Y are two points on the sides AB and AC respectively in ΔABC, such that AX = 3.4 cm, AB = 8.5 cm, AY = 2.6 cm and YC = 3.9 cm. Which of the following relations is correct ? **1**



(A) BC = 2XY (B) 3BC = 2XY

(C) 2BC = 5XY (D) BC =3 XY

9 In the given figure, RJ and RL are two tangents to the circle. If $\angle RJL = 42°$, then the measure of $\angle JOL$ is : **1**



(A) 42° (B) 84° (C) 96° (D) 138°

10 The centre of a circle is at (2, 0). If one end of a diameter is at (6, 0), then the other end is at: **1**

(A) (0,0) (B) (4,0) (C) $(-2,0)$ (D) $(-6,0)$

11 For the following distribution, **1**

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

the sum of the lower limits of the median and modal class is

(A) 15 (B) 25 (C) 30 (D) 35

12 Two coins are tossed together. The probability of getting at least one head is : **1**

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) 1

13 If the distance between the points $(4, p)$ and (1, 0) is 5, then the value of p is **1**

(A) 4 only (B) ± 4 (C) – 4 only (D) 0

14 The volume of the largest right circular cone that can be carved out from a solid cube of edge 2 cm is: **1**

(A) $\frac{4\pi}{3}$ cu cm (B) $\frac{5\pi}{3}$ cu cm (C) $\frac{8\pi}{3}$ cu cm (D) $\frac{2\pi}{3}$ cu cm

15 Using the empirical relationship between measures of central tendency, the mode is equal to **1**

(A) 2 Median − 3 Mean (B) 3 Median − 2 Mean

(C) 3 Median + 2 Mean (D) 2 Median + 3 Mean

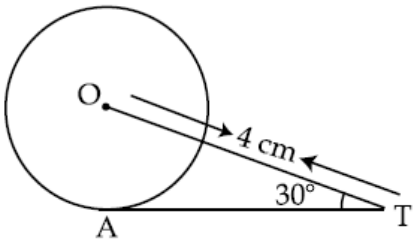
16 Which term of the AP: $-29, -26, -23, \ldots\ldots, 61$ is the first positive term? **1**

(A) 11^{th} (B) 10^{th} (C) 16^{th} (D) 31^{st}

17 $\frac{(1-\tan^2 30^0)}{(1+\tan^2 30^0)}$ is equal to : **1**

(A) sin 60° (B) cos 60° (C) tan 60° (D) cot 30°

18 In the given figure, AT is a tangent to the circle with centre O such that OT = 4 cm and ∠OTA = 30°. Then AT is equal to **1**



(A) 4 cm (B) 2 cm (C) $2\sqrt{3}$ cm (D) $4\sqrt{3}$ cm

Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.
(A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(B) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(C) Assertion (A) is true but reason (R) is false.
(D) Assertion (A) is false but reason (R) is true.

19 **Statement A (Assertion):** If three sectors whose sector angles are 35°, 65° and 80° are cut from a circle, then the sum of their sector areas is half of the area of the circle. **1**
Statement R (Reason): If θ is the angle (in degrees) of a sector of a circle of radius *r*, then area of the sector is $\frac{\theta}{360^\circ}\ \pi r^2$.

20 **Statement A (Assertion):** HCF and LCM of two natural numbers are 25 and 815 respectively. **1**
Statement R(Reason) : LCM of two natural numbers is always divisible by their HCF**.**

SECTION B

Section B consists of 5 questions of 2 marks each.

21 Find the value of x if **2**

$$3\ tan^2 60^\circ - x\ sin^2 45^\circ + \frac{3}{4} sec^2 30^\circ\ = 2$$

22 (a) Prove that $3\ +\ 2\sqrt{5}$ is irrational, given that $\sqrt{5}$ is irrational. **2**

OR

(b) The traffic lights at three different road crossings change after every 48 seconds, 60 seconds and 72 seconds respectively. If they change simultaneously at 7 A.M., at what time will they change simultaneously again?

23 Find the ratio in which the *y*-axis divides the line segment joining the points (5, – 6) and (–1, – 4). Also find the point of intersection. **2**

24 Find a relation between x and y such that the point (x, y) is equidistant from the points (7, −1) and (3, 5). **2**

25 (a) Two dice are thrown at the same time and the product of the numbers appearing on top is noted. Find the probability that **2**

(i) the product of the numbers lies between 8 and 13

(ii) the product of the numbers is 6

OR

(b) Find the probability that a leap year chosen at random has

(i) 53 Sundays

(ii) 52 Sundays

SECTION C

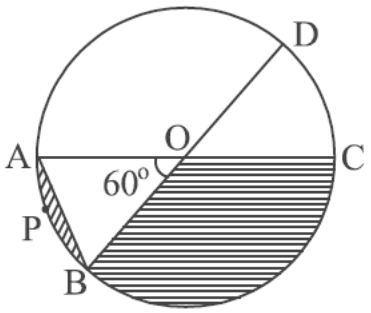
Section C consists of 6 questions of 3 marks each.

26 (a) In the given figure, diameters AC and BD of the circle intersect at O. If ∠AOB = 60° and OA = 10 cm, then : **3**

(i) find the length of the chord AB.

(ii) find the area of shaded region.

(Take $\pi = 3.14$ and $\sqrt{3} = 1.73$)



OR

(b) A chord of a circle of radius 20 cm subtends an angle of 90° at the centre. Find the area of the corresponding major segment of the circle. (Use π = 3.14).

27 Prove that **3**

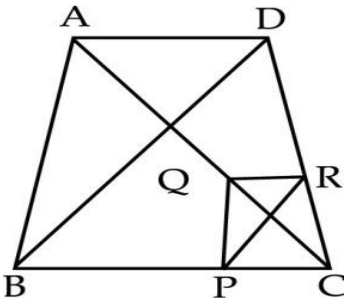
$$\frac{\cos\theta - \sin\theta + 1}{\cos\theta + \sin\theta + 1} = sec\ \theta - \tan\theta$$

28 National Art convention got registrations from students from all parts of the country, of which 60 are interested in music, 84 are interested in dance and 108 students are interested in handicrafts. The organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same artform and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. **3**

29 In a class test, the sum of Arun's marks in Mathematics and English is 30. Had he got 3 marks more in Mathematics and 2 marks less in English, the product of their marks would have been 240. Find his marks in the two subjects. **3**

30 If α and β are the zeros of the polynomial $3y^2 - 5y + 2$, find a quadratic polynomial whose zeros are α^2 and β^2. **3**

31 (a) In the given figure, two triangles ABC and DBC lie on same side of BC such that PQ | | BA and PR| |BD. Prove that QR| |AD. **3**



OR

(b) If AD and PM are medians of triangles ABC and PQR, respectively where Δ ABC ~ Δ PQR, prove that $\frac{AB}{PQ} = \frac{AD}{PM}$.

SECTION D

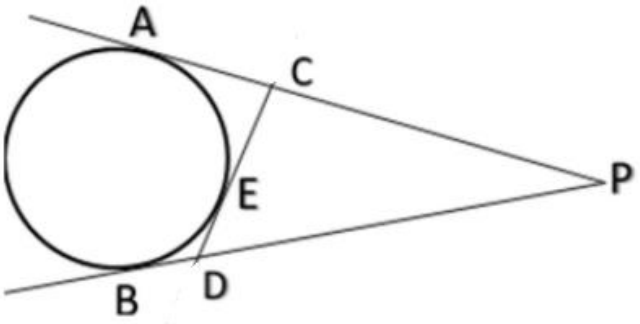
Section D consists of 4 questions of 5 marks each.

32 At a given instance, the angle of elevation of a jet plane from a point on the ground is 60°. After a flight of 15 seconds, it is observed that the angle of elevation changes to 30°. The height of the plane remains constantly as $1500\sqrt{3}$ m. What is the speed of the plane in km/hr? **5**

33 Prove that the lengths of tangents drawn from an external point to a circle are equal. **5**

From an external point P, two tangents, PA and PB are drawn to a circle. At a point E on the circle, a tangent is drawn to intersect PA and PB at C and D, respectively.

Prove that PA = $\frac{1}{2}$ Perimeter of ΔPCD.



34 (a) The median of the distribution given below is 35. Find the values of x and y, if sum of all frequencies is 170. **5**

Class Interval	**Frequency**
0 – 10	10
10 – 20	20
20 – 30	x
30 – 40	40
40 – 50	y
50 – 60	25
60 - 70	15

OR

(b) Calculate the mean and mode of the following frequency distribution :

Class :	Below 30	Below 50	Below 70	Below 90	Below 110	Below 130
Frequency :	5	13	25	45	48	50

35 (a) Solve graphically the pair of linear equations: **5**

$2x + y = 8$; $x + 1 = 2y$.

Also, determine the coordinates of the vertices of the triangle formed by these lines and the *x*-axis.

OR

(b) The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.

SECTION E

Case study based questions are compulsory.

36 Case Study 1

India has a rich legacy in toy-making. Historically Indian toys date back to 5000 years.

The Thanjavur doll is a type of traditional Indian bobblehead toy made of terracotta material. These toys are traditionally handmade, finished with detailed, painted exteriors.

A solid toy, made of wood, is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Rahul wants to pack the toy in a cylindrical box, which circumscribes the toy.

Use the above information to answer the questions that follow-

(i) Determine the slant height of the conical part of the toy. **1**

(ii) Find the total surface area of the toy. **2**

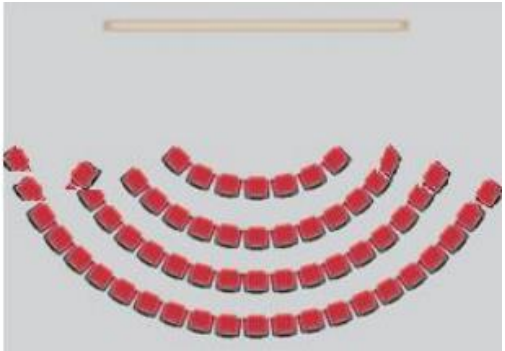
OR

Find the volume of wood in the toy.

(iii) Find the area of the cardboard required for packing. **1**

37 Case Study 2

A school auditorium has to be constructed. The chairs in the auditorium are arranged in a concave shape facing towards the stage in such a way that each succeeding row has 5 seats more than the previous one. Due to shortage of funds, only 25 rows were constructed in the beginning.



(i) If the first row has 15 seats, then how many seats will be there in 12th row? **1**

(ii) What is the total number of seats in the auditorium? **1**

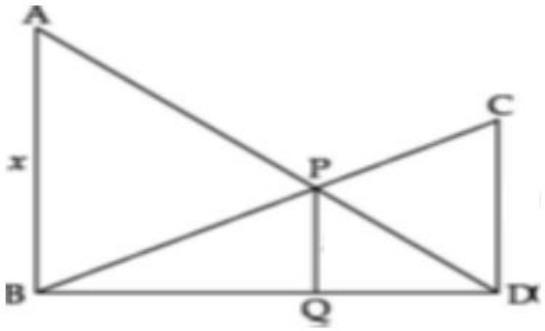
(iii) If total 1250 guests were there in the auditorium for a particular event, then how many rows were occupied? **2**

OR

Suppose 5 more rows of seats are built later, how many additional seats will the auditorium have?

38 Case Study 3

A girl observes three poles AB, PQ and CD at an instant as shown in figure. It is being given that AB = x m, PQ = 3.6 m, CD = 5.4 m and BD = 24 m.



Based on the above information, solve the following questions:

(i) Prove that $\Delta BPQ \sim \Delta BCD$. **1**

(ii) Find the distance BQ. **1**

(iii) Find the height of the pole AB. **2**

OR

Prove that $\frac{1}{AB} + \frac{1}{CD} = \frac{1}{PQ}$.